

## **The structure of matter**

**SUBJECT:** Chemistry

**STANDARD:** #1 (Indiana)

**C.1.26:** Describe physical changes and properties of matter through sketches and descriptions of the involved materials.

**C.1.33:** Use an element's location in the Periodic Table to determine its number of valence electrons, and predict what stable ion or ions an element is likely to form in reacting with other specified elements.

**KEY CONCEPTS:** The structure of matter

**GENERALIZATION:** Describe the possible subatomic particles within an atom or ion.

**BACKGROUND:** Students have discussed Dalton's Atomic Theory, including its correct and incorrect points. The location and properties of the three subatomic particles has been discussed.

**TIERED IN:** Process

**TIERED ACCORDING TO:** Learning style

**Lesson one:**

**Ask students the following question:** Are you an Actor, Artist, or Author?

**Disperse into groups in separate areas of the room according to their response to the question.**

### **TIER 1: ARTISTS**

**Students are given the following instruction:** Using objects in the room construct, or draw on paper a model of an oxygen atom. Your masterpiece must include location and properties of the three main subatomic particles. Be prepared to have a spokesperson describe your work of art.

### **TIER 2 : ACTORS**

**Students are given the following instruction:** Using yourselves as the subatomic particles, depict what a boron atom would look like if we could see its particles. Your skit must include location and properties of the three main subatomic particles. Be prepared to have a spokesperson describe your animation.

### **TIER 3 : AUTHORS**

**Students are given the following instruction:** Write a short description of the structure of a sodium atom. Be sure to include location and properties of all subatomic particles. Be prepared to have a spokesperson share your description with the class.

**ASSESSMENT:** Each group will be assessed on the accuracy of their spokesperson's summary of the following points:

1. Correct location of protons, electrons, and neutrons. (In nucleus or moving around nucleus).
2. Relative masses of protons, electrons, and neutrons.
3. Charge of protons, electrons, and neutron.

## **Lesson 2**

### **LESSON 2**

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**KEY CONCEPT:** The structure of matter

**GENERALIZATION:** Describe the possible subatomic particles within an atom or ion.

Given some specific information about an isotope, the student must be able to write its name; symbol; tell # of protons, electrons, and neutrons; identify its mass number and atomic number.

**BACKGROUND:** Students have discussed structure of atoms, and how two atoms of the same element may differ. The concept of mass number and atomic number has been introduced as well as how to write names and symbols of isotopes.

**TIERED IN: Product**

### **TIERED ACCORDING TO: Readiness**

Students will be grouped by teacher according to level of understanding as determined by the teacher based on discussion prior to activity. Subgroups will be formed within each group so that each subgroup has no more than 3 students in it.

#### **TIER 1**

Students will be given a chart of 15 isotopes. The chart will contain the name and symbol of the isotope. The students must complete the chart, which will contain number of protons, electrons, and neutrons, mass number, and atomic number.

#### **TIER 2**

Students will be given a chart of 15 isotopes. The chart will contain information in any of one or two categories of the following: name; symbol; number of protons, electrons, neutrons; mass number; atomic number. The students must complete the chart for each isotope.

#### **TIER 3**

Students will choose one isotope from a list provided by the teacher. Working in pairs the students will research the properties (including name; symbol; number of protons, neutrons, and electrons; mass number; and atomic number), uses, and production of the isotope using the internet. They will then write a short, factual report on the isotope.

**ASSESSMENT:** Each student will be given a quiz in which they must provide specific information about certain isotopes. Information will include name; symbol; number of protons, electrons, and neutrons; mass number; and atomic number.

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**KEY CONCEPT:** The structure of matter

**GENERALIZATIONS:** Describe the possible subatomic particles within an

atom or ion. Use an element's location in the Periodic Table to determine its number of valence electrons, and predict what stable ion or ions an element is likely to form.

**BACKGROUND:** Students have discussed atomic structure, including electron configurations, as well as how and why ions become more stable than their ionic form.

**TIERED IN:** Process

**TIERED ACCORDING TO:** Readiness

Students will be grouped by the teacher according to level of understanding as determined by the teacher based on individual exercises that were completed following a discussion of ions.

### **TIER 1**

Students will be given 10 Bohr diagrams of elements in periods 1-4 which will show the correct number of electrons in each energy level. The diagram will include the name of the element as well as what period and group it is found in on the Periodic Table. Students must identify the valence electrons; tell what will happen to the electrons when this element forms an ion, how many protons and electrons the ion has, and what the ion's charge will be.

### **TIER 2**

Students will be given the names of 10 elements in periods 1-4 of the Periodic Table. Students must identify how many valence electrons each has, tell what will happen to the electrons when this element forms an ion, how many electrons and protons the ion has, and what its charge will be.

### **TIER 3**

Students will be given the names of 5 elements in periods 3-7 of the Periodic Table. Students must identify how many valence electrons each has, as well as predict all possible stable ions for each element, including the number of electrons and protons for each ion and what the charge of each ion is.

**ASSESSMENT:** Students will be assessed based on the accuracy of their completed group project. In addition, each student will be given a quiz in which they must predict ion charge, number of electrons and protons in an ion, and valence electrons.